

MISSION SUPPORT

FY 2001 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

PROGRAM GOALS

The primary goal of this budget segment is to acquire and maintain a civil service workforce which reflects the cultural diversity of the Nation and, along with the infrastructure, is sized and skilled consistent with accomplishing NASA's research, development, and operational missions with innovation, excellence, and efficiency. The budget proposed is constructed to achieve that goal.

STRATEGY FOR ACHIEVING GOALS

This civil service workforce is the underpinning for the successful accomplishment of the Nation's civil aeronautics and space programs. These are the people who plan the programs; conduct and oversee the research; select and monitor the contractors; manage the various research, development, and test activities; and oversee all of NASA's operations. A key dimension of the reinvention of NASA has been the restructuring of the civil service workforce to deliver a space and aeronautics program that is balanced, relevant, and at the forefront of technology development.

From FY 1993 to FY 1999, the Agency has been among the "leaders" throughout the executive branch in reducing its civil service workforce by over 6,600. This represents more than a 26 percent reduction. Due to various concerns raised to senior management (primarily safety and reduced staffing in mission critical areas) that we had gone too far too fast in our reductions based on the Zero Based Review (ZBR). NASA initiated a Core Capabilities review to re-assess our workforce needs. The results of this review recommended increasing the workforce at the Human Space Flight centers and Headquarters and stabilizing the NASA workforce throughout the rest of the Agency. These increases at the Human Space Flight centers and Headquarters will begin in FY 2000 and are necessary to strengthen management oversight, program management, and to ensure Shuttle safety and the successful integration of the Space Station. This will result in increased staffing levels in FY 2000 and again in FY 2001. The remaining NASA centers, that have reached the targets associated with the Strategic plan, Centers of Excellence, and Lead Center roles defined over the past several years, will maintain these staff levels and continue to replenish and rebalance skills drained during downsizing.

The Research and Program Management (R&PM) program provides the salaries, other personnel and related costs, travel and the necessary support for all of NASA's administrative functions and other basic services in support of research and development activities at NASA installations. The salaries, benefits, and supporting costs of this workforce comprise approximately 78% of the requested funding. Administrative and other support is 20% of the requests. The remaining 2% of the request is required to fund travel necessary to manage NASA and its programs.

ACCOMPLISHMENTS & PROPOSED RESULTS

NASA has once again achieved its full-time (FTE) targets included in the NASA Workforce Restructuring plan for FY 1999 ahead of schedule. The agency continued to make progress towards specific workforce goals established by the National Performance Review (NPR). These goals were met ahead of schedule through implementation of a restrictive hiring policy and buyouts conducted in FY 1999. The successful buyout used in FY 1999 resulted in more than 300 voluntary losses. The agency used only 18,278 FTE compared to its original plan of 18,545.

The Agency also successfully met the other goals for FY 1999 established as part of the NPR:

- The supervisory span of control has gone from 1:5 in FY 1993 to 1:10 in FY 1999.
- Efforts to reduce specific administrative positions continue on target
- Headquarters employment has been reduced by more than 1,140 from FY 1993

The FY 2001 budget estimate of \$2,290.6 million for Research and Program Management represents an increase to the aggressive downsizing levels NASA has proposed since FY 1993. The requested funding level for FY 2001 is an increase of \$73.0 million from the FY 2000 budget plan of \$1,217.6 million. Of this total increase, Personnel and related costs increase by \$97.3 million from FY 2000 to FY 2001. These increases fully fund the civil service workforce, an increase of 328 FTE's from the expected FY 2000 level of 18,413, the full year cost of the 2000 payraise, the payraise projected to be effective in January, 2001 and normal salary growth. Travel represents a slight increase of \$1.5 million over the FY 2000 budget plan due to increased requirements for Space Station. Research Operations Support decreases by \$25.8 million from the FY 2000 budget plan due to transfers out of ROS into the Rocket Propulsion Testing program and Construction of Facilities (Coff) coupled with the FY 2000 rescission offset by a slight increase for Headquarters Operations.

In summary, the FY 2001 budget requirement of \$2,290.6 million will provide for 18,741 FTE civil service workyears to support the activities at nine NASA Installations and Headquarters.

The following describes, in detail, the cost elements within this program.

I. Personnel and Related Costs

A. Compensation and Benefits

1. Compensation

- a. Permanent Positions: This part of Personnel and Related Costs covers the salaries of the full-time permanent civil service workforce and is the largest portion of this functional category.
- b. Other Than Full-Time Permanent Positions: This category includes the salaries of NASA's non-permanent workforce. Programs such as Presidential Management Interns, students participating in cooperative training, summer employment, youth opportunity, and temporary clerical support are covered in this category.

- c. Reimbursable Detailees: In accordance with existing agreements, NASA reimburses the parent Federal organization for the salaries and related costs of persons detailed to NASA.
 - d. Overtime and Other Compensation: Overtime, holiday, post and night differential, and hazardous duty pay are included in this category. Also included are incentive awards for outstanding achievement and superior performance.
2. Benefits: In addition to compensation, NASA, as authorized and required by law, makes the employer's contribution to personnel benefits. These benefits include contributions to the Civil Service Retirement Fund, the Federal Employees Retirement System, employees' life and health insurance, payments to the Medicare fund for permanent employees, and social security contributions. Payments to the civil service retirement fund for re-employed annuitants and severance pay to former employees involuntarily separated through no fault of their own are also included.

B. Supporting Costs

- 1. Transfer of Personnel: Provided under this category are relocation costs required by law, such as the expenses of selling and buying a home, subsistence expenses, and the movement and storage of household goods.
- 2. Investigative Services: The Office of Personnel Management is reimbursed for activities such as security investigations of new hires and revalidation of sensitive position clearances, recruitment advertising, personnel studies and Federal wage system surveys.
- 3. Personnel Training: Training is provided within the framework of the Government Employees Training Act of 1958. Part of the training costs is for courses offered by other Government agencies, and the remainder is for training through nongovernment sources.

II. Travel

- A. Program Travel: The largest part of travel is for direction, coordination, and management of program activities including international programs and activities. The complexity of the programs and the geographical distribution of NASA Installations and contractors necessitate this category of travel. As projects reach the flight stage, support is required for prelaunch activities including overseas travel to launch and tracking sites. The amount of travel required for flight projects is significant as it is directly related to the number of systems and subsystems, the number of design reviews, and the number and complexity of the launches and associated ground operations.
- B. Scientific and Technical Development Travel: Travel to scientific and technical meetings and seminars permits employees engaged in research and development to participate in both Government sponsored and nongovernment

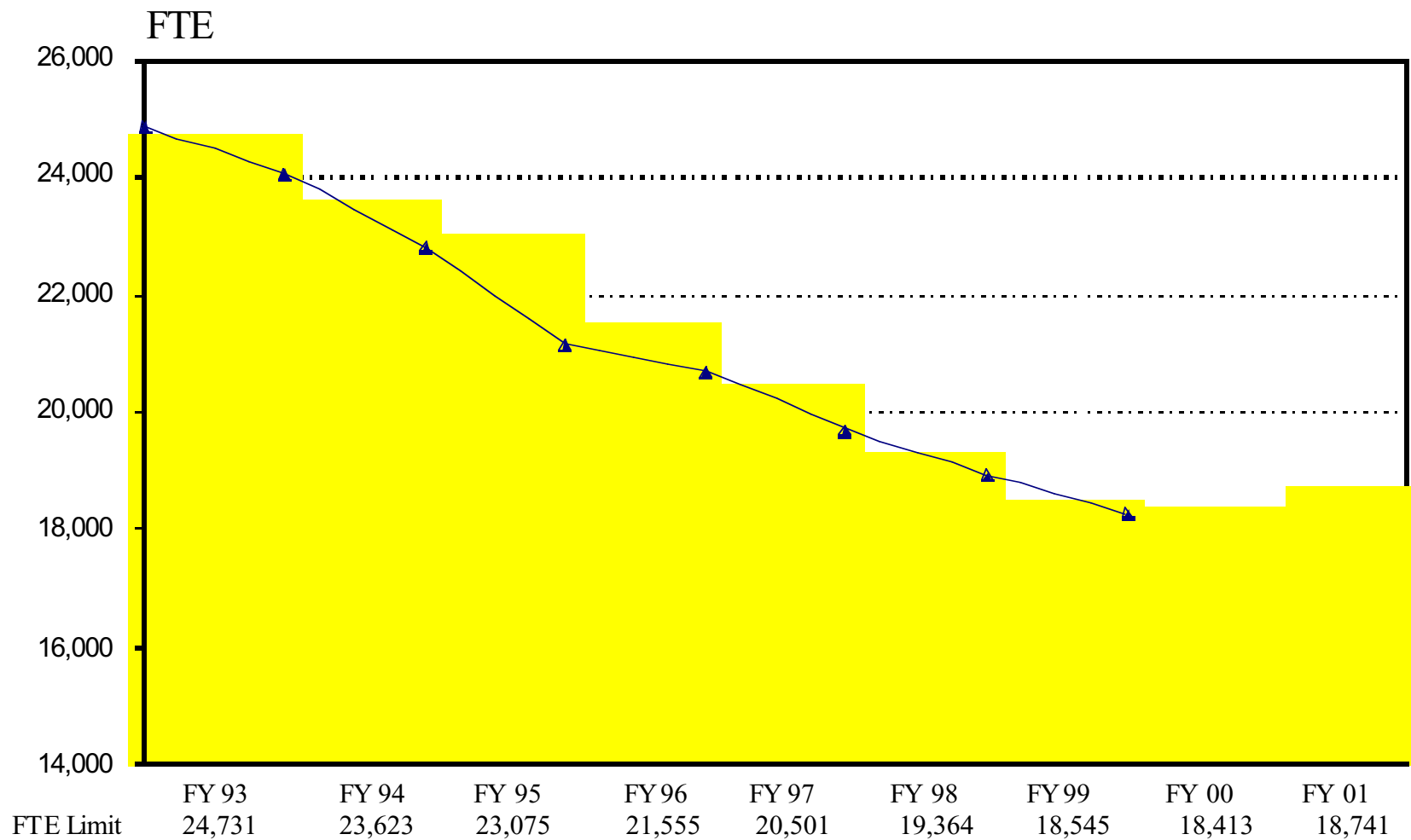
sponsored activities. This participation allows personnel to benefit from exposure to technological advances, which arise outside NASA, as well as allowing personnel to present both accomplishments and problems to their associates and provides for the dissemination of technical results to the United States community.

- C. Management and Operations Travel: Management and operations travel provides for the direction and coordination of general management matters and travel by officials to review the status of programs. It also includes travel by functional managers in such areas as personnel, financial management, and procurement. This category also includes the cost of travel of unpaid members of research advisory committees; and initial duty station, permanent change of assignment, and related travel expenses.

III. Research Operations Support

- A. Facilities Services: Facilities Services provides basic security, fire protection, and other custodial services. It also provides maintenance of roads and grounds and of all administrative buildings and facilities. Finally, it provides rental of administrative buildings and all utility costs of administrative buildings.
- B. Technical Services: Technical Services provides the Administrative Automatic Data Processing capability that supports Accounting, Payroll, Budgeting, Procurement, and Personnel as well as all the other Administrative functions. It also funds the Graphics and Photographic support to these functions. Finally, it funds the Installation-wide safety and public information programs.
- C. Management and Operations: Management and Operations funds the telephone, mail, and logistics systems, the administrative equipment and supplies, and the transportation system including the general purpose motor pools and the program support aircraft. It also funds the basic medical and environmental health programs. Finally, it funds printing and reproduction and all other support, such as small contract and purchases for the Center Directors staff and the Administrative functions.

NASA FTE Civil Service Reduction Plan



Does not include the NASA Office of Inspector General

SUMMARY OF BUDGET PLAN BY FUNCTION
(Thousands of Dollars)

	<u>FY 1999</u> <u>OPLAN</u> <u>12/23/1999</u>	<u>FY 2000</u> <u>OPLAN</u> <u>REVISED</u>	<u>FY 2001</u> <u>PRES</u> <u>BUDGET</u>
PERSONNEL AND RELATED COSTS	\$1,598,600	\$1,683,100	\$1,780,400
TRAVEL	\$47,800	\$51,700	\$53,200
RESEARCH OPERATIONS SUPPORT	<u>\$463,200</u>	<u>\$482,824</u>	<u>\$457,000</u>
TOTAL PROGRAM PLAN	<u>\$2,109,600</u>	<u>\$2,217,624</u>	<u>\$2,290,600</u>

DETAIL OF BUDGET PLAN BY FUNCTION
(Thousands of Dollars)

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
I. Personnel and related costs	<u>\$1,598,600</u>	<u>\$1,683,100</u>	<u>\$1,780,400</u>
<u>A. Compensation and benefits</u>	<u>\$1,542,600</u>	<u>\$1,624,300</u>	<u>\$1,728,500</u>
1. Compensation	\$1,266,700	\$1,339,800	\$1,419,800
2. Benefits	\$275,900	\$284,500	\$308,700
<u>B. Supporting costs</u>	<u>\$56,000</u>	<u>\$58,800</u>	<u>\$51,900</u>
1. Transfer of personnel	\$7,900	\$13,200	\$7,400
2. Investigative services	\$2,200	\$3,600	\$2,100
3. Personnel training	\$45,900	\$42,000	\$42,400
II. Travel	<u>\$47,800</u>	<u>\$51,700</u>	<u>\$53,200</u>
A. Program travel	\$30,000	\$32,100	\$32,600
B. Scientific and technical development travel	\$6,000	\$6,800	\$7,000
C. Management and operations travel	\$11,800	\$12,800	\$13,600
III. Research operations support	<u>\$463,200</u>	<u>\$482,824</u>	<u>\$457,000</u>
A. Facilities services	\$130,100	\$130,224	\$121,500
B. Technical services	\$193,300	\$211,100	\$190,000
C. Management and operations	\$139,800	\$141,500	\$145,500
Total	<u>\$2,109,600</u>	<u>\$2,217,624</u>	<u>\$2,290,600</u>

DISTRIBUTION OF BUDGET PLAN BY FUNCTION BY INSTALLATION
(Thousands of Dollars)

FUNCTION	TOTAL NASA	JSC	KSC	MSFC	SSC	GSFC	ARC	DFRC	LARC	GRC	HQS
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PERSONNEL AND RELATED COSTS

FY 1999	1,598,600	285,200	150,400	227,800	20,000	274,000	138,700	49,600	184,800	163,200	104,900
FY 2000	1,683,100	291,400	160,000	236,100	22,600	285,300	141,600	53,100	198,500	170,400	124,100
FY 2001	1,780,400	308,600	167,300	250,900	24,200	298,700	153,000	57,300	209,300	179,200	131,900

TRAVEL

FY 1999	47,800	8,800	4,300	6,600	600	7,500	3,300	1,600	4,700	3,700	6,700
FY 2000	51,700	8,800	5,300	6,100	700	7,300	3,500	1,400	4,400	3,500	10,700
FY 2001	53,200	8,800	5,300	6,100	700	7,300	3,500	1,400	4,500	3,800	11,800

RESEARCH OPERATIONS SUPPORT

FY 1999	463,200	40,600	91,600	53,400	20,700	52,500	28,900	5,500	24,900	27,100	118,000
FY 2000	482,824	39,900	90,000	52,754	22,100	56,600	28,929	4,423	19,994	24,700	143,424
FY 2001	457,000	44,500	75,500	53,500	18,400	61,700	30,300	3,000	26,600	22,600	120,900

TOTAL

FY 1999	2,109,600	334,600	246,300	287,800	41,300	334,000	170,900	56,700	214,400	194,000	229,600
FY 2000	2,217,624	340,100	255,300	294,954	45,400	349,200	174,029	58,923	222,894	198,600	278,224
FY 2001	2,290,600	361,900	248,100	310,500	43,300	367,700	186,800	61,700	240,400	205,600	264,600

SUMMARY OF BUDGET PLAN BY INSTALLATION
(Thousands of Dollars)

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
JOHNSON SPACE CENTER	\$334,600	\$340,100	\$361,900
KENNEDY SPACE CENTER	\$246,300	\$255,300	\$248,100
MARSHALL SPACE FLIGHT CENTER	\$287,800	\$294,954	\$310,500
STENNIS SPACE CENTER	\$41,300	\$45,400	\$43,300
AMES RESEARCH CENTER	\$170,900	\$174,029	\$186,800
DRYDEN FLIGHT RESEARCH CENTER	\$56,700	\$58,923	\$61,700
LANGLEY RESEARCH CENTER	\$214,400	\$222,894	\$240,400
GLENN RESEARCH CENTER	\$194,000	\$198,600	\$205,600
GODDARD SPACE FLIGHT CENTER	\$334,000	\$349,200	\$367,700
HEADQUARTERS	<u>\$229,600</u>	<u>\$278,224</u>	<u>\$264,600</u>
AGENCY TOTAL	<u>\$2,109,600</u>	<u>\$2,217,624</u>	<u>\$2,290,600</u>

DISTRIBUTION OF FULL-TIME EQUIVALENT (FTE) WORKYEARS BY INSTALLATION

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
Johnson Space Center	3,040	2,926	3,030
Kennedy Space Center	1,759	1,806	1,825
Marshall Space Flight Center	2,653	2,651	2,758
Stennis Space Center	252	272	280
Goddard Space Flight Center	3,263	3,282	3,282
Ames Research Center	1,460	1,457	1,486
Dryden Flight Research Center	597	634	634
Langley Research Center	2,328	2,382	2,387
Glenn Research Center	1,991	1,983	1,972
Headquarters	<u>935</u>	<u>1,020</u>	<u>1,087</u>
Total, full-time equivalents	<u>18,278</u>	<u>18,413</u>	<u>18,741</u>

DISTRIBUTION OF FULL-TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
SPACE SCIENCE	<u>1,846</u>	<u>1,751</u>	<u>1,708</u>
Major Development Programs	363	285	232
Payloads Program	73	43	39
Explorer Program	225	208	181
Mars Surveyor Program	41	49	47
Discovery Program	15	14	17
Operating Missions	79	83	81
Research and Technology	1,050	1,069	1,111
HUMAN EXPLOR. & DEVELOPMENT OF SPACE	<u>5,364</u>	<u>5,294</u>	<u>5,627</u>
International Space Station	2,136	2,385	2,328
Space Operations (SOMO)	358	281	271
Space Flight Operations (Space Shuttle)	1,819	1,754	2,017
Payload & ELV	274	304	353
Life & Microgravity Sciences & Apps	420	481	498
Investment - HEDS	357	89	160
EARTH SCIENCE	<u>1,365</u>	<u>1,382</u>	<u>1,419</u>
Earth Observing System Program	512	593	689
Earth Probes Program	110	121	73
Operating Missions	34	32	30
Research and Technology	622	554	546
ES Reimbursable Activities	87	82	81
AERO-SPACE TECHNOLOGY	<u>4,227</u>	<u>4,227</u>	<u>4,414</u>
Aero-space Focused Programs	945	1,218	1,408
High Speed Research Program	273	3	1
Advanced Subsonics Tech Program	298	51	94
Aero-Space Base	2,405	2,672	2,630
Commercial Technology Program	215	191	190
Investment - AST	91	92	91
PROGRAM OPERATIONS	<u>5,476</u>	<u>5,759</u>	<u>5,573</u>
Corporate Programs	210	240	232
Corporate Operations	1,052	1,140	1,207
Center Operations	4,214	4,379	4,134
Total full-time equivalents	<u>18,278</u>	<u>18,413</u>	<u>18,741</u>

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 2001 ESTIMATES

LYNDON B. JOHNSON SPACE CENTER

ROLES AND MISSIONS

SPACE STATION - The Johnson Space Center (JSC) has lead center management responsibility for the International Space Station program. In addition, specific JSC technical responsibilities include development of a set of facilities and systems to conduct the operations of the Space Station including on-orbit control of the Space Station.

The Center also provides institutional personnel as well as engineering and testbed support to the Space Station program. This includes test capabilities, the provision of Government Furnished Equipment (GFE), and engineering analysis support for the work of the prime contractor, its major subcontractors, and NASA system engineering and integration efforts.

SPACE SHUTTLE - JSC has lead center management responsibility for the Space Shuttle. In addition, JSC will provide development, integration, and operations support for the Mission Control Center (MCC), the Shuttle Mission Simulator (SMS), and other ground facilities needed for Space Shuttle Operations. JSC will provide Space Shuttle operational flight program management including system integration, crew equipment modification and processing, crew training, flight mission planning and operations, and procurement of Orbiter hardware.

PAYLOAD AND UTILIZATION OPERATIONS - JSC will also conduct concept studies and development on flight systems and options for human transportation. JSC provides support to the engineering and technical base, payload operations and support equipment, and technology program support.

SPACE SCIENCE - The Center will support the Agency's planetary science program in the area of geosciences required to support future programs, provide curatorial support for lunar materials, assist in information dissemination, and interact with outside scientists. This research focuses on the composition, structures, and evolutionary histories of the solid bodies of the universe.

LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS - JSC is the Lead Center for the following programs/functions; Biomedical Research and Countermeasures; Advanced Human Support Technologies; and Space Medicine. It also has a supporting role in the Microgravity Research program in biotechnology. As part of these activities, JSC will evaluate human physiological changes associated with the space flight environment and develop effective countermeasures to assure crew health and optimal performance during all phases of flight. Protection of flight crew members from the hazards of space radiation is one of NASA's highest priorities. A strategic plan for Space Radiation Health has been developed to acquire the knowledge necessary to predict radiation risks in space and to develop countermeasures that include advances

at the cutting edge of modern technology. JSC will also define and develop on-board health care systems and environmental monitoring systems; crew medical training; ground-based medical support of missions; develop a longitudinal crew health data base; and develop medical and psychological crew selection criteria. The JSC has established a center for the support of biotechnology applications in Microgravity in order to study growth factors, medical chemo/immunotherapeutic, and human tissue transplantation. The Center will integrate life science flight experiments for Spacehab and the ISS; operate integrated payload systems; and train mission specialists in the science aspects of their missions.

MISSION/SPACE COMMUNICATION SERVICES - The Space Operations Management Office (SOMO), manages the telecommunication, data processing, mission operation, and mission planning services needed to ensure that the goals of NASA's exploration, science, and research and development programs are met in an integrated and cost-effective manner. The SOMO also provides the administration and management of the Consolidated Space Operations Contract (CSOC).

CENTER MANAGEMENT AND OPERATIONS - Provides management, administrative, and financial oversight of NASA programmatic elements under JSC cognizance. In addition, the center provides for the operation and maintenance of the institutional facilities, systems, and equipment.

DISTRIBUTION OF FULL-TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

JOHNSON SPACE CENTER

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
SPACE SCIENCE	<u>30</u>	<u>40</u>	<u>36</u>
Major Development Programs	0	0	0
Mars Surveyor Program	0	6	3
Discovery Program	2	3	3
Operating Missions	1	1	1
Research and Technology	27	30	29
HUMAN EXPLOR. & DEVELOPMENT OF SPACE	<u>2,112</u>	<u>1,994</u>	<u>2,080</u>
International Space Station	883	1,013	1,021
Space Operations (SOMO)	31	29	30
Space Flight Operations (Space Shuttle)	841	834	905
Life & Microgravity Sciences & Apps	98	87	89
Investment - HEDS	259	31	35
AERO-SPACE TECHNOLOGY	<u>23</u>	<u>25</u>	<u>24</u>
Aero-Space Focused Programs	2	1	0
Aero-Space Base	5	8	8
Commercial Technology Program	16	16	16
PROGRAM OPERATIONS	<u>875</u>	<u>867</u>	<u>890</u>
Corporate Programs	15	18	24
Corporate Operations	9	9	9
Center Operations	851	840	857
Total full-time equivalents	<u>3,040</u>	<u>2,926</u>	<u>3,030</u>

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 2001 ESTIMATES

JOHN F. KENNEDY SPACE CENTER

ROLES AND MISSIONS

SPACE STATION - The Kennedy Space Center (KSC) is a supporting center for the Space Station Program. The KSC has developed a set of facilities, systems, and capabilities to conduct the operations of the Space Station. KSC develops launch site operations capabilities for conducting pre-launch and post-landing ground operations including integrated testing, interface verification, servicing, launch activities, and experiment-to rack physical integration. The KSC provides launch site logistics support, resupply and customer utilization. The KSC serves as the primary agent for management and integration of ground processes for all U.S. launched International Space Station (ISS) elements from manufacture and assembly through verification and launch. The KSC develops and maintains ISS flight systems expertise to support the ISS on-orbit mission and retains technical and operational experience within NASA and KSC for ground processing and verification of space flight hardware for follow-on programs.

SPACE SHUTTLE - KSC will provide Space Shuttle launch preparation, including orbiter processing, and Ground Support Equipment (GSE) logistics; and operation and maintenance of GSE.

PAYLOAD CARRIERS AND SUPPORT - KSC is the Lead Center for the Payload Carriers and Support Program. KSC provides technical expertise, facilities and capabilities to perform payload buildup, test and checkout, integration and servicing of multiple payloads; development, operation, logistics and maintenance of Ground Support Equipment; transportation of payloads and supporting equipment to the Space Shuttle; and integration and installation of the payloads into the Space Shuttle. The KSC develops, activates, operates and maintains the Payload Carrier facility system, GSE, and processes to enable efficient launch site processing of carriers and payloads.

EXPENDABLE LAUNCH VEHICLES - KSC will provide government insight/oversight of all launch vehicle and payload processing and checkout activities for all NASA contracted expendable launch vehicle and upper stage launch services both at KSC and the Vandenberg Air Force Base.

CENTER MANAGEMENT AND OPERATIONS - KSC will provide administrative and financial services in support of Center management and will provide for the operation and maintenance of the institutional facilities, systems, laboratories, test beds, associated technical infrastructure, and equipment.

DISTRIBUTION OF FULL-TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM
KENNEDY SPACE CENTER

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
HUMAN EXPLOR. & DEVELOPMENT OF SPACE	<u>1,246</u>	<u>1,173</u>	<u>1,304</u>
International Space Station	346	321	328
Space Flight Operations (Space Shuttle)	630	563	657
Payload & ELV Support	206	236	269
Life & Microgravity Sciences & Apps	16	15	16
Investment - HEDS	48	38	34
AERO-SPACE TECHNOLOGY	<u>33</u>	<u>48</u>	<u>37</u>
Aero-Space Focused Programs	15	30	21
Commercial Technology Program	18	18	16
PROGRAM OPERATIONS	<u>480</u>	<u>585</u>	<u>484</u>
Corporate Programs	<u>29</u>	<u>31</u>	<u>31</u>
Center Operations	451	554	453
Total full-time equivalents	<u>1,759</u>	<u>1,806</u>	<u>1,825</u>

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 2001 ESTIMATES

GEORGE C. MARSHALL SPACE FLIGHT CENTER

ROLES AND MISSIONS

SPACE STATION - The center will provide engineering support to the program including engineering analysis in support of the International Space Station (ISS) system engineering and integration effort and will provide the lead for the design and development of the ISS Environmental Control and Life Support System (ECLSS) and the ISS Propulsion Module. In addition, the center has oversight responsibility for the development of the Nodes 1 & 2, Multi Purpose Logistics Module and Interim Control Module as well as design integration of cargo elements for flight on the MSFC provided unpressurized logistics carrier to support ISS mission build and logistics supply flights. MSFC also has responsibility for developing payload utilization capabilities and planning and executing payload integration and operations activities. This includes the development and operation of the EXPRESS Rack payload carrier, the Payload Operations Integration Center, ISS Payload Data Services System and the ISS Payload Planning System. MSFC's Lead Center Microgravity Research responsibilities include managing the development of major facilities to be permanently housed on the ISS which include the Materials Science Research Facility, Biotechnology Facility, Fluids and Combustion Facility, Low Temperature Microgravity Physics Facility, and Microgravity Science Glovebox.

SPACE SHUTTLE - The Space Shuttle Projects Office (SSPO) is responsible for executing the Space Shuttle Program role assigned to MSFC. These responsibilities include activities associated with the Space Shuttle Main Engine (SSME), External Tank (ET), Solid Rocket Booster (SRB), and Reusable Solid Rocket Motor (RSRM). The SSPO is responsible for these propulsion hardware elements and associated systems, test and flight operations, and facilities.

SPACE SCIENCE - The Science Directorate at MSFC will foster the generation and communication of knowledge relative to Space Science. As the NASA lead center for Chandra development and operations, following its successful launch and deployment on July 23, 1999, MSFC continues to lead the on-orbit science operations phase. MSFC will also continue leading the Relativity Mission (Gravity Probe-B) as well as management of other selected payloads. Leading the Agency in Space Optics Manufacturing and Technology, MSFC will develop ultra lightweight large-aperture optics and optical technology for space applications, providing world class facilities and capabilities for optics fabrication, metrology, and testing that will benefit NASA, other government agencies, academia, and industry. In addition, MSFC oversees the National Center for Space Science and Technology, in cooperation with other government agencies, academia, and industry to aid in the development of products that benefit humankind.

LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS - As NASA's Lead Center for Microgravity Research, MSFC will manage and provide the fundamental science and technology for processing materials under conditions that allow detailed examination of the constraints imposed by gravitational forces. MSFC will perform research in the areas of crystal growth, fluid physics, biophysics, solidification mechanics, and polymeric materials. The Center will define and develop hardware apparatus for Microgravity research, and perform and manage research objectives, implementation, and applications to advance knowledge and strengthen the foundations for continuing the exploration and development of space. Also, MSFC is

responsible for implementing the Materials Science and Biotechnology Science disciplines, the Glovebox Program, and Space Product Development within the Microgravity Research Program. Furthermore, emphasis will be given to developing and transitioning to the private sector the technology and applications of products developed for space. MSFC's efforts enable scientific and commercial researchers the unique opportunity to use the low-gravity environment of space as a catalyst to generate new knowledge, products, and service that improve the quality of life on earth.

SPACE TRANSPORTATION - The MSFC Space Transportation Directorate is responsible for executing the NASA Lead Center role for the space transportation systems development activities. The Center will consolidate space transportation programs and projects at MSFC and will plan, direct, and execute research, technology maturation, advanced design and development, and sustaining engineering for NASA's space transportation systems, including expendable and reusable launch vehicles, heavy lift vehicles, upper stages, in-space transportation systems, and other associated transportation systems and subsystems. MSFC will integrate program and project level planning, research, and development to ensure a well-balanced space transportation development program that meets the Agency's aggregate needs in a coordinated and integrated manner. The Center will provide propulsion and vehicle technology to reduce the cost and schedule risk in the development of next generation space transportation vehicles. It will develop technology in vehicle and propulsion systems, advanced manufacturing processes, and materials and structures. The Center will conduct technology efforts, under contract including cooperative agreements, with the U.S. launch vehicle industry, to improve the competitiveness of current systems. Specific responsibilities within space transportation include managing the governmental participation in the X-33 Program, a cooperative partnership with industry; Integrating the Future-X Pathfinder Experimental Flight Projects; Managing and integrating propulsion module flight elements for the International Space Station.

EARTH SCIENCE - MSFC is studying the interrelationship of global-scale climate processes and regional-scale hydrology, which is the science of water's distribution and variability over Earth, its integrating role in linking the planet's physical, biogeochemical, and geophysical fluid subsystems, and the associated human dimensions of Earth system variability. Utilizing global observations and information systems, improved and validated predictive models will be developed. MSFC will manage science strategy and implement the process to establish a world class institution focused on research, applications, and education concerning climate change and the water cycle of the Earth systems. MSFC will also lead in the operation of the Global Hydrology and Climate Center.

MISSION/SPACE COMMUNICATION SERVICES - MSFC manages and maintains the NASA Integrated Services Network (NISN) - NISN services provide communications hardware, software, and transmission medium that inter-connects NASA Headquarters, installations, universities, and major contractor locations for the transfer of data, voice, and video.

CENTER MANAGEMENT AND OPERATIONS - MSFC provides administrative and financial services in support of Center management and provides for the operation and maintenance of the institutional facilities, systems, and equipment. Lead center for the development and implementation of the NASA Automation Consolidation Center (NACC), Agency Consolidated Payroll, Earned Value Performance Management, and Agency Logistics Business Systems Operations and Maintenance.

DISTRIBUTION OF FULL-TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM
MARSHALL SPACE FLIGHT CENTER

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
SPACE SCIENCE	<u>265</u>	<u>168</u>	<u>149</u>
Major Development Programs	96	10	7
Operating Missions	4	2	2
Research and Technology	165	156	140
HUMAN EXPLOR. & DEVELOPMENT OF SPACE	<u>1,109</u>	<u>1,224</u>	<u>1,308</u>
International Space Station	612	736	702
Space Operations (SOMO)	12	11	11
Space Flight Operations (Space Shuttle)	325	337	435
Payload & ELV	11	11	26
Life & Microgravity Sciences & Apps	102	112	112
Investment - HEDS	47	17	22
EARTH SCIENCE	<u>98</u>	<u>46</u>	<u>46</u>
Earth Observing System Program	6	4	4
Operating Missions	1	0	0
Research and Technology	80	35	35
ES Reimbursable Activities	11	7	7
AERO-SPACE TECHNOLOGY	<u>526</u>	<u>603</u>	<u>664</u>
Aero-Space Focused Programs	371	216	244
Advanced Subsonics Tech Program	0	49	92
Aero-Space Base	<u>112</u>	<u>307</u>	<u>297</u>
Commercial Technology Program	<u>43</u>	<u>31</u>	<u>31</u>
PROGRAM OPERATIONS	<u>655</u>	<u>610</u>	<u>591</u>
Corporate Programs	<u>44</u>	<u>44</u>	<u>26</u>
Corporate Operations	<u>34</u>	<u>34</u>	<u>33</u>
Center Operations	577	532	532
Total full-time equivalents	<u>2,653</u>	<u>2,651</u>	<u>2,758</u>

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 2001 ESTIMATES

JOHN C. STENNIS SPACE CENTER

ROLES AND MISSIONS

HUMAN SPACE FLIGHT - As the Lead Center for Propulsion Testing, SSC will operate, maintain, and manage a propulsion test capability that includes test facilities at JSC/WSTF, MSFC and GRC/Plum Brook and related systems for development, certification, and acceptance of rocket propulsion systems and components. The Center will provide, maintain and manage the facilities and the related capabilities required for the continued development and acceptance testing of the Space Shuttle Main Engines. SSC will also maintain and support the Center's technical core laboratory and operations to enable SSC to conduct advanced propulsion test technology research and development for government and commercial propulsion programs.

EARTH SCIENCE - Through the Commercial Remote Sensing Program, SSC will enhance U.S. economic competitiveness via commercial partnership programs that apply remote sensing technologies in business applications and reduce new product development costs. As part of the Applied Research and Data Analysis program, SSC will conduct fundamental and applied research which increases our understanding of environmental systems sciences, with emphasis on coastal research of both land and oceans.

AERONAUTICAL RESEARCH AND TECHNOLOGY - Through the Technology Transfer and Small Business Innovative Research programs, SSC will broaden and accelerate the development of spin-off technologies derived from national investments in aerospace research. SSC will also support the development of new and innovative propulsion technologies through the Advanced Space Transportation Program that supports the agency goal of reducing the cost of access to space.

CENTER MANAGEMENT AND OPERATIONS - SSC provides administrative and financial services in support of Center management and provides for the operation and maintenance of the institutional facilities, systems, and equipment. The Center will provide, operate, maintain, and manage the institutional base and laboratories required to support NASA programs, Commercial programs and other Federal and State agencies and organizations resident at the SSC.

DISTRIBUTION OF FULL-TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM
STENNIS SPACE CENTER

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
HUMAN EXPLOR. & DEVELOPMENT OF SPACE	<u>15</u>	<u>15</u>	<u>81</u>
Space Flight Operations (Space Shuttle)	12	12	12
Investment - HEDS	3	3	69
EARTH SCIENCE	<u>26</u>	<u>26</u>	<u>26</u>
Research and Technology	26	26	26
AERO-SPACE TECHNOLOGY	<u>44</u>	<u>22</u>	<u>35</u>
Aero-Space Focused Programs	33	16	20
Advanced Subsonics Tech Program	0	0	0
Aero-Space Base	8	3	12
Commercial Technology Program	3	3	3
PROGRAM OPERATIONS	<u>167</u>	<u>209</u>	<u>138</u>
Corporate Programs	16	26	33
Center Operations	151	183	105
Total full-time equivalents	<u>252</u>	<u>272</u>	<u>280</u>

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 2001 ESTIMATES

GODDARD SPACE FLIGHT CENTER

ROLES AND MISSIONS

SPACE SHUTTLE/PAYLOAD AND UTILIZATION OPERATIONS - GSFC manages flights of the Hitchhiker, a reusable carrier system which provides increased flight opportunities with reduced leadtime while maximizing Space Shuttle load factors and minimizing spaceflight costs. GSFC also manages and coordinates the Agency's Get Away Special (GAS) program.

SPACE SCIENCE - GSFC manages physics and astronomy activities in the following discipline areas: gamma ray astronomy, X-ray astronomy, ultraviolet and optical astronomy, infrared and radio astronomy, particle astrophysics, solar physics, interplanetary physics, planetary magnetospheres, and astrochemistry. GSFC is also responsible for conducting the mission operations for a variety of operating spacecraft. Other activities include managing NASA's sounding rocket and scientific balloon program.

GSFC also conducts planetary exploration research into the physics of interplanetary and planetary space environments. Participates in planetary mission instrument development, operations, and data analysis. GSFC develops technologies targeted at improved spaceborne instruments, and on-board spacecraft systems and subsystems.

EARTH SCIENCE - Lead Center for Earth Science, including the Earth Observing System (EOS). The primary objective of the EOS is to record global change and to observe regional-to-global processes. The EOS will document global change over a fifteen year period to provide long-term, consistent data sets for use in modeling and understanding global processes. This process and modeling research effort will provide the basis for establishing predictive global change models for policy makers and scientists.

Manages Earth Probes and New Millennium flight projects; manages, on a reimbursable basis, the acquisition of meteorological observing spacecraft for the National Oceanic and Atmospheric Administration (NOAA). Conducts science correlation measurements from balloons, sounding rockets, aircraft, and ground installations.

AERONAUTICAL RESEARCH AND TECHNOLOGY - The Wallops Flight Facility provides institutional and technical support to Langley Research Center, other NASA centers, and commercial users who conduct flight studies of new approach and landing procedures using the latest in guidance equipment and techniques, pilot information displays, human factors data, and terminal area navigation. As an integral partner in the Agency's High Performance Computing and Communications (HPCC) program, GSFC leads an effort to enhance the infusion of HPCC technologies into the Earth community through the

provision of advanced computer architectures and communication technologies. Promotes private sector investment in space-based technologies through the transfer of technologies that derive from NASA's programs and activities.

MISSION/SPACE COMMUNICATION SERVICES - Research and technology involves the investigation and development of advanced systems and techniques for spacecraft communications and tracking, command and control, and data acquisition and processing. The primary objectives are to apply technology and develop advanced capabilities to meet the tracking and data processing requirements of new missions and to improve the cost effectiveness and reliability of flight mission support.

Although the Johnson Space Center is designated as the Space Operations Lead Center, GSFC manages a number of critical program elements, including operation of the Tracking and Data Relay Satellite System (TDRSS); the development of the replenishment TDRSS spacecraft; mission control, data processing, and orbit/attitude computation support; operating the Space Tracking and Data Network (STDN), the NASA Communications (NASCOM) Network, and the Aeronautics, Balloons and Sounding Rocket Program.

The NASCOM Network links the stations of the Deep Space Network (DSN), STDN, TDRSS, and other tracking and data acquisition elements with control centers and data processing and computation centers.

CENTER MANAGEMENT AND OPERATIONS - Provides administrative and financial services in support of Center management and provides for the operation and maintenance of the institutional facilities, systems, and equipment.

DISTRIBUTION OF FULL-TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

GODDARD SPACE FLIGHT CENTER

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
SPACE SCIENCE	<u>1,010</u>	<u>1,013</u>	<u>990</u>
Major Development Programs	193	201	167
Payloads Program	73	43	39
Explorer Program	221	204	177
Mars Surveyor Program	4	3	2
Discovery Program	4	4	6
Operating Missions	69	75	78
Research and Technology	446	483	521
HUMAN EXPLOR. & DEVELOPMENT OF SPACE	<u>307</u>	<u>223</u>	<u>214</u>
Space Operations (SOMO)	257	175	166
Space Flight Operations (Space Shuttle)	4	2	2
Payload & ELV	46	46	46
EARTH SCIENCE	<u>882</u>	<u>940</u>	<u>964</u>
Earth Observing System Program	430	513	607
Earth Probes Program	97	108	58
Operating Missions	32	31	29
Research and Technology	247	213	196
ES Reimbursable Activities	76	75	74
AERO-SPACE TECHNOLOGY	<u>45</u>	<u>48</u>	<u>46</u>
High Speed Research Program	2	3	1
Advanced Subsonics Tech Program	4	2	2
Commercial Technology Program	39	43	43
PROGRAM OPERATIONS	<u>1,019</u>	<u>1,058</u>	<u>1,068</u>
Corporate Programs	33	45	40
Corporate Operations	69	69	70
Center Operations	917	944	958
Total full-time equivalents	<u>3,263</u>	<u>3,282</u>	<u>3,282</u>

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 2001 ESTIMATES

AMES RESEARCH CENTER

ROLES AND MISSIONS

AERO-SPACE TECHNOLOGY – Conduct aeronautics research in ground-based and airborne automation technologies, human factors, and operational methodologies for safe and efficient airspace operations. Perform Agency-wide leadership to conduct research and technology development to enable and foster the intelligent vehicle of the future through the implementation of integrated vehicle health management as a vehicle discipline. Provide high-fidelity flight simulations to support national goals in aviation safety and capacity, as well as vehicle development requirements. Conduct research on advanced thermal protection systems and perform arcjet testing to meet national needs for access to space and planetary exploration. Strengthen basic research and technology development of aircraft, space access vehicles, and space operations. Develop an integrated set of experimental and computational technologies built around an embedded information systems backbone, to provide rapid, accurate vehicle synthesis and testing capabilities. Conduct research spanning computation through flight, for Rotorcraft and Powered Lift configurations and for high performance aircraft, for improved efficiency, affordability, and performance. Emphasize joint research and technology projects with other NASA installations, government agencies, industry and academia. This will be achieved through a balance of Research and Technology Base programs that address fundamental knowledge and long-term opportunities. A series of Focused Technology Programs capitalize on these opportunities with concentrated efforts.

SPACE SCIENCE - Ames has the agency lead role in Astrobiology (the study of life in the universe) which focuses on the origin of life and its possible development on other worlds. Research includes advanced laboratory and computation facilities for astrochemistry; planetary atmosphere modeling, including relationships to the atmosphere of the Earth; the formation of stars and planetary systems; and an infrared technology program to investigate the nature and evolution of astronomical systems. Development continues of the Stratospheric Observatory for Infrared Astronomy (SOFIA) for research to be conducted by various NASA/university teams. Research and development in advanced information technologies are directed toward significantly increasing the efficiency of SOFIA as it becomes operational. Ames is the lead center for information technology efforts in the cross-enterprise spacecraft technology program. In addition, Ames is the lead center for the Intelligent Systems program which provides critical, next-generation information technology capabilities for ongoing NASA missions and activities.

LIFE AND MICROGRAVITY SCIENCE - Ames has the agency lead role in Gravitational Biology and Ecology programs. These synergistic programs examine the adaptation of life forms to reduced gravity. Research continues into the effects of gravity on living systems using spaceflight experiments, ground simulation, and hypergravity facilities to understand how gravity affects the development, structure and functions of living systems. Development continues on the Space Station Biological Research Project, the key life science facility aboard the International Space Station. Also studied are options for

preventing problems in crew health and psychophysiology during and after extended spaceflight. Ames has a primary focus on advanced physical/chemical technologies for life support, including research into all aspects of regenerative life support. Research is conducted in the areas of ecosystems and health monitoring.

EARTH SCIENCE - Ames builds instruments and computer models for the measurement and analysis of atmospheric constituents and properties from aircraft platform are being developed. Applied research and developments to enhance the use of remote and in-situ sensing technology for Earth resources applications continues.

SAFETY AND MISSION ASSURANCE - Provide institutional safety and health programs and develop and integrate Safety and Mission Assurance guidelines into program and project development. Ames has created a Systems Management function to assist programs and projects in their initial development phase to ensure their successful implementation.

CENTER MANAGEMENT AND OPERATIONS - Provide administrative and financial services in support of Center management and provides for the operation and maintenance of the institutional facilities, systems and equipment. Ames recently achieved ISO certification.

DISTRIBUTION OF FULL-TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM
AMES RESEARCH CENTER

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
SPACE SCIENCE	<u>211</u>	<u>226</u>	<u>241</u>
Major Development Programs	59	59	55
Mars Surveyor Program	2	5	5
Discovery Program	2	0	0
Research and Technology	148	162	181
HUMAN EXPLOR. & DEVELOPMENT OF SPACE	<u>110</u>	<u>122</u>	<u>122</u>
International Space Station	53	65	68
Space Flight Operations (Space Shuttle)	2	2	2
Life & Microgravity Sciences & Apps	55	55	52
EARTH SCIENCE	<u>40</u>	<u>51</u>	<u>61</u>
Earth Observing System Program	1	1	2
Research and Technology	39	50	59
AERO-SPACE TECHNOLOGY	<u>714</u>	<u>671</u>	<u>675</u>
Aero-Space Focused Programs	198	240	235
High Speed Research Program	26	0	0
Advanced Subsonics Tech Program	48	0	0
Aero-Space Base	401	392	401
Commercial Technology Program	17	15	15
Investment - AST	24	24	24
PROGRAM OPERATIONS	<u>385</u>	<u>387</u>	<u>387</u>
Corporate Programs	15	15	16
Corporate Operations	5	8	8
Center Operations	365	364	363
Total full-time equivalents	<u>1,460</u>	<u>1,457</u>	<u>1,486</u>

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 2001 ESTIMATES

DRYDEN FLIGHT RESEARCH CENTER

CENTER ROLES AND MISSIONS

AERO-SPACE TECHNOLOGY - Develop, manage, and maintain facilities and testbed aircraft to support safe, timely, and cost effective NASA flight research and to support industry, university, and other government agency flight programs.

Conceive, formulate, and conduct piloted and unpiloted research programs in disciplinary technology, integrated aeronautical systems, and advanced concepts to meet current and future missions throughout subsonic, supersonic, and hypersonic flight regimes.

Conduct flight research programs in cooperation with other NASA Installations, other government agencies, the aerospace industry, and universities. Transition results, techniques, methods, and tools to industry and government users in a timely manner.

DFRC will also provide flight test support for atmospheric tests of experimental or developmental launch systems, including reusable systems.

INTERNATIONAL SPACE STATION – Conduct technology development and flight test of a prototype emergency Crew Return Vehicle (CRV).

SPACE SHUTTLE /PAYLOAD AND UTILIZATION OPERATIONS - Provide operational and technical support for the conduct of Space Shuttle missions, including on-orbit tracking and communications, landing support of crew and science requirements.

EARTH SCIENCE - Conduct flight operations in support of Airborne Science Missions utilizing aircraft for data collection and observation.

CENTER MANAGEMENT AND OPERATIONS - Provide administrative services in support of Center management and provide for the operation and maintenance of the Institutional facilities, systems and equipment.

DISTRIBUTION OF FULL-TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM
DRYDEN FLIGHT RESEARCH CENTER

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
HUMAN EXPLOR. & DEVELOPMENT OF SPACE	<u>51</u>	<u>53</u>	<u>49</u>
International Space Station	25	29	25
Space Operations (SOMO)	21	20	20
Space Flight Operations (Space Shuttle)	5	4	4
EARTH SCIENCE	<u>27</u>	<u>27</u>	<u>27</u>
Research and Technology	27	27	27
AERO-SPACE TECHNOLOGY	<u>399</u>	<u>396</u>	<u>401</u>
Aero-Space Focused Programs	59	71	76
Aero-Space Base	326	313	313
Commercial Technology Program	5	3	3
Investment - AST	9	9	9
PROGRAM OPERATIONS	<u>120</u>	<u>158</u>	<u>157</u>
Corporate Programs	13	17	10
Center Operations	107	141	147
Total full-time equivalents	<u>597</u>	<u>634</u>	<u>634</u>

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 2001 ESTIMATE

LANGLEY RESEARCH CENTER

CENTER ROLES AND MISSIONS

AERO-SPACE RESEARCH AND TECHNOLOGY - Conduct advanced research in fundamental aerodynamics; high-speed, highly maneuverable aircraft technology; hypersonic propulsion; guidance and controls; acoustics; and structures and materials. Develop a technology base for improving transport, fighter, general aviation, and commuter aircraft. Conduct an aeronautical research and technology program to study current and future technology requirements and to demonstrate technology applications. Conduct theoretical and experimental research in fluid and flight mechanics to determine aerodynamic flows and complex aircraft motions. Conduct research to develop Intelligent Synthesis Environment (ISE) technologies and capabilities that permit the integration of widely distributed science, technology, and engineering teams and that provide advanced tools enabling the teams to create innovative, affordable products rapidly.

Develop innovative new airframe systems to improve safety, reduce emissions and noise to improve environmental compatibility, increase capacity, and reduce cost per seat mile of commercial transport and general aviation aircraft. Conduct control and guidance research programs to advance technology in aircraft guidance and navigation, aircraft control systems, cockpit systems integration and interfacing techniques, and performance validation and verification methods. Conduct research in aircraft noise prediction and abatement. Pioneer the development of new materials, structural concepts, and fabrication technologies to revolutionize the cost, performance, and safety of future aircraft structures for radically new aircraft designs. Provide Agencywide leadership and strategically maintain or increase the agency's preeminent position in structures and materials by serving as the NASA Center of Excellence for Structures and Materials. Conduct aeronautics and space research and technology development for advanced aerospace transportation systems, including hypersonic aircraft, missiles, and space access vehicles using airbreathing and rocket propulsion. Specific technology discipline areas of expertise are aerodynamics, aerothermodynamics, structures, materials, hypersonic propulsion, guidance and controls, and systems analysis. Conduct long-range studies directed at defining the technology requirements for advanced transportation systems and missions. Develop technology options for realization of practical hypersonic and transatmospheric flight.

EARTH SCIENCE - Perform an agency-designated Atmospheric Science mission role in support of the Earth Science Enterprise in the NASA Strategic Plan. As Lead Center for Focused Atmospheric Science Missions, conduct a world-class peer reviewed and selected atmospheric science program in support of national goals in preserving the environment and in fundamental science. Specific discipline areas of expertise are Earth radiation research, particularly the role of clouds in the Earth's energy budget; middle and upper atmospheric research; and tropospheric research. Perform innovative scientific research to advance the knowledge of atmospheric radiative, chemical, and dynamic processes for understanding global change; develop innovative passive and active sensor systems concepts for atmospheric science measurements. Conduct a technology development program that develops advanced laser and LIDAR technologies for Earth science missions; advanced passive remote sensing technologies; develop advanced ultra-lightweight and adaptive materials,

structural systems technologies and analytical tools for significantly reducing the end-to-end cost and increasing the performance of earth observation space instruments and systems. Conduct an Application and Educational Outreach program that utilizes scientific data for non-scientific applications and in support of science and math education. Serve as a Primary Data Analysis and Archival Center (DAAC) for Earth Radiation and Atmospheric Chemistry for the Earth Observing System.

SPACE SCIENCES -Support the solicitation and selection process of the Office of Space Science's (OSS) Discovery, Explorer and Solar Terrestrial Probes Programs; conduct reviews of candidate and selected missions and independent assessments of on-going space science missions to help ensure that OSS criteria for high quality science return within cost and schedule constraints are met. Conduct a technology development program that develops advanced ultra-lightweight and adaptive materials, structural systems technologies and analytical tools for significantly reducing the end-to-end cost and increasing the performance of space science instruments and systems. Langley is developing the SABER instrument which is on the TIMED mission to explore the mesosphere and lower thermosphere globally and achieve a major improvement in the understanding of the fundamental processes governing energetics, chemistry, dynamics and transport. Langley is also analyzing SAMPEX data to assess the relative importance of solar terrestrial coupling due to varying electron precipitation compared to that due to 11-year solar flux variations. Langley has provided and continues to provide analysis of spacecraft aerodynamics, aerothermodynamics and flight dynamics for spacecraft entering planetary atmospheres (including Earth) in support of both spacecraft design and flight operations. Langley is also responsible for the design and development of the Earth Entry Vehicle for the Mars Sample Return Mission currently scheduled to launch in 2005.

LIFE AND MICROGRAVITY SCIENCES - Conduct space radiation exposure studies in support of current and future human space efforts for a more accurate assessment of astronaut radiation exposures and body shielding factors.

HUMAN EXPLORATION AND DEVELOPMENT OF SPACE - Support the Human Exploration and Development of Space through systems analyses of Space Station evolution and future human space exploration missions.

SYSTEMS ANALYSIS/INDEPENDENT PROGRAM EVALUATION AND ASSESSMENT - Serve as the Agency lead center for systems analysis and the conduct of independent evaluation, assessment, and cost estimation of Agency programs. Maintain, as a Center core competency, appropriate expertise and analysis tools to support the Agency's Strategic Enterprises in the definition and development of advanced systems concepts to achieve NASA's goals. Utilize core systems analysis capabilities (supplemented with expertise from other Centers as appropriate) to support the Office of the Administrator by conducting independent assessments of advanced concepts and proposed new systems to validate conceptual level designs prior to Agency commitment to major developmental funding. Provide Agencywide independent cost estimates and analysis for programs and projects. Support the Administrator's Program Management Council (PMC) in the organization, administration, and technical support of PMC review process.

CENTER MANAGEMENT AND OPERATIONS - Provide administrative and financial services in support of Center management and provide for the operation and maintenance of the institutional facilities, systems, and equipment.

DISTRIBUTION OF FULL-TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM
LANGLEY RESEARCH CENTER

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
SPACE SCIENCE	<u>119</u>	<u>119</u>	<u>114</u>
Major Development Programs	15	15	3
Explorer Program	4	4	4
Mars Surveyor Program	35	35	37
Discovery Program	7	7	8
Operating Missions	5	5	0
Research and Technology	53	53	62
HUMAN EXPLOR. & DEVELOPMENT OF SPACE	<u>41</u>	<u>41</u>	<u>48</u>
International Space Station	30	30	36
Payload & ELV	11	11	12
EARTH SCIENCE	<u>292</u>	<u>292</u>	<u>295</u>
Earth Observing System Program	75	75	76
Earth Probes Program	13	13	15
Operating Missions	1	1	1
Research and Technology	203	203	203
AERO-SPACE TECHNOLOGY	<u>1,418</u>	<u>1,440</u>	<u>1,535</u>
Aero-Space Focused Programs	162	378	488
High Speed Research Program	105	0	0
Advanced Subsonics Tech Program	115	0	0
Aero-Space Base	958	984	968
Commercial Technology Program	42	42	43
Investment - AST	36	36	36
PROGRAM OPERATIONS	<u>458</u>	<u>490</u>	<u>395</u>
Corporate Programs	24	24	32
Center Operations	434	466	363
Total full-time equivalents	<u>2,328</u>	<u>2,382</u>	<u>2,387</u>

RESEARCH AND PROGRAM MANAGEMENT
FISCAL YEAR 2001 ESTIMATES
GLENN RESEARCH CENTER at LEWIS FIELD
ROLES AND MISSIONS

LIFE AND MICROGRAVITY SCIENCES - The Glenn Research Center (GRC) provides leadership and management of the fluid physics, combustion science and acceleration measurement disciplines of NASA's Microgravity Science Program. Sponsors and conducts ground-based scientific studies that may lead to experiments in space. GRC has a substantial effort in the design, buildup, testing, integration and telescience operations of hardware for experiments to be launched aboard the Space Shuttle and the utilization of the Space Station for scientific missions.

SPACE STATION - GRC support to the space station program includes technical and management support in the areas of power and on-board propulsion components and system, engineering and analysis, technical expertise, and testing for components and systems. This includes use of facilities and testbeds and construction of flight hardware as required.

MISSION COMMUNICATIONS SERVICES - GRC develops and demonstrates communications and networks technologies in relevant environments to enhance the performance of existing mission services or enable new services. The Center identifies and infuses new capabilities at higher frequencies (Ka-band and above) into the next generation of spacecraft and communications satellites, to enable seamless interoperability between NASA assets and commercial space and ground networks. The Center also ensures timely and high quality availability of radio frequency spectrum to enable the realization of NASA goals.

AERONAUTICAL RESEARCH AND TECHNOLOGY - As the NASA Lead Center for Aeropropulsion, GRC conducts world-class research critical to the Agency Aero-Space Technology Enterprise goals of developing and transferring enabling technologies to U.S. industry and other government agencies. The Center's Aeropropulsion programs are essential to achieving National goals to promote economic growth and national security through safe, superior, and environmentally compatible U.S. civil and military aircraft propulsion systems. The Aeropropulsion Program spans subsonic, supersonic, hypersonic, general aviation, high performance aircraft, and access-to-space propulsion systems through innovative application of research in turbomachinery materials, structures, internal fluid mechanics, instrumentation and controls, interdisciplinary technologies, and aircraft icing. GRC has research expertise in world-class facilities critical to insuring U.S. leadership in aviation, FAA, EPA, and DOD in particular depend on NASA GRC research for advancements in emissions, noise, engine performance and new materials.

As the NASA Center of Excellence in Turbomachinery, GRC's expertise is critical to advancing the Agency's goals in the aeronautics and space programs. This enables GRC to be a cost effective resource across multiple Agency programs in the vital and strategic discipline area of turbomachinery. Turbomachinery based areas of expertise include air breathing

propulsion and power systems, primary and auxiliary propulsion and power systems, on-board propulsion systems, and rotating machinery for the pumping of fuels/propellants.

The Ultra Efficient Engine Technology Program is planned and designed to develop high-payoff, high-risk technologies to enable the next breakthroughs in propulsion systems to spawn a new generation of high performance, operationally efficient and economical, reliable and environmentally compatible U.S. aircraft. The breakthrough technologies are focused on propulsion component and high temperature engine materials development and demonstrations enabling future commercial and military propulsion systems which are greatly simplified, achieve higher performance, and have potential for much reduced environmental impact with a broad range of aircraft application. Six investment areas form the basis for the technical approach: materials & structures, combustion, turbomachinery, intelligent propulsion system controls, integration & assessments, and integrated component technology.

CENTER MANAGEMENT AND OPERATIONS - Provides administrative and financial services in support of Center Management and provides for the operation and maintenance of the institutional facilities, systems, and equipment.

DISTRIBUTION OF FULL-TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM
GLENN RESEARCH CENTER

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
SPACE SCIENCE	<u>211</u>	<u>185</u>	<u>178</u>
Research and Technology	211	185	178
HUMAN EXPLOR. & DEVELOPMENT OF SPACE	<u>373</u>	<u>449</u>	<u>421</u>
International Space Station	187	191	148
Space Operations (SOMO)	37	46	44
Life & Microgravity Sciences & Apps	149	212	229
AERO-SPACE TECHNOLOGY	<u>1,025</u>	<u>974</u>	<u>997</u>
Aero-Space Focused Programs	105	266	324
High Speed Research Program	140	0	0
Advanced Subsonics Tech Program	131	0	0
Aero-Space Base	595	665	631
Commercial Technology Program	32	20	20
Investment - AST	22	23	22
PROGRAM OPERATIONS	<u>382</u>	<u>375</u>	<u>376</u>
Corporate Programs	21	20	20
Center Operations	361	355	356
Total full-time equivalents	<u>1,991</u>	<u>1,983</u>	<u>1,972</u>

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 2001 ESTIMATES

NASA HEADQUARTERS

ROLES AND MISSIONS

NASA Corporate Headquarters

MISSION - The mission of Headquarters is to plan and provide executive direction for the implementation of U. S. space exploration, space science, aeronautics, and technology programs. This includes corporate policy development, program formulation, resource allocations, program performance assessment, long-term institutional investments, and external advocacy for all of NASA.

MAJOR CORPORATE ROLES - At NASA Headquarters, the broad framework for program formulation will be conducted through four Strategic Enterprises: Human Exploration and Development of Space, Earth Science, Aeronautics - Space Technology, and Space Science. Consistent with the NASA strategic plan, the Strategic Enterprises develop program goals and objectives to meet the needs of external customers within the policy priorities of the Administration and Congress.

Corporate level enabling processes and staff functions will provide cross-cutting interfaces required to support the Strategic Enterprises in legislative affairs, public affairs, budget and financial management, equal opportunity programs, human resources, education, legal affairs, procurement, international affairs, management systems and facilities, information systems and technology, small business, safety and mission quality, advisory committees, and policy and plans.

DISTRIBUTION OF FULL-TIME EQUIVALENT (FTE) WORKYEARS BY PROGRAM

NASA HEADQUARTERS

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
PROGRAM OPERATIONS	<u>935</u>	<u>1,020</u>	<u>1,087</u>
Corporate Operations	935	1,020	1,087
Total full-time equivalents	<u>935</u>	<u>1,020</u>	<u>1,087</u>

DETAIL OF PERMANENT POSITIONS

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
Executive level II	1	1	1
Executive level IV	<u>2</u>	<u>2</u>	<u>2</u>
Subtotal	3	3	3
ES-6	36	50	50
ES-5	70	109	109
ES-4	121	146	146
ES-3	52	70	70
ES-2	54	62	62
ES-1	<u>66</u>	<u>68</u>	<u>68</u>
Subtotal	399	505	505
CA	1	1	1
SL/ST	56	56	56
GS-15	2381	2392	2405
GS-14	3535	3567	3607
GS-13	5834	5866	5906
GS-12	1785	1817	1857
GS-11	1205	1205	1205
GS-10	244	244	244
GS-9	489	596	695
GS-8	261	261	261
GS-7	589	696	794
GS-6	490	490	490
GS-5	104	104	104
GS-4	20	20	20
GS-3	5	5	5
GS-2	<u>2</u>	<u>2</u>	<u>2</u>
Subtotal	17,001	17,322	17,652
Special ungraded positions established by NASA Administrator	26	26	26
Ungraded positions	<u>309</u>	<u>309</u>	<u>309</u>
Total permanent positions	<u>17,738</u>	<u>18,165</u>	<u>18,495</u>
Unfilled positions, EOY	<u>0</u>	<u>0</u>	<u>0</u>
Total, permanent employment, EOY	<u>17,738</u>	<u>18,165</u>	<u>18,495</u>

PERSONNEL SUMMARY

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
Average GS/GM grade	12.53	12.48	12.43
Average ES salary	\$121,218	\$126,430	\$131,942
Average GS/GM salary	\$67,079	\$70,299	\$73,392
Average salary of special ungraded positions established by NASA Administrator	\$88,071	\$91,594	\$95,624
Average salary of ungraded positions	\$46,522	\$48,383	\$50,512

CENTER LOCATIONS AND CAPITAL INVESTMENT

JOHNSON SPACE CENTER - The Lyndon B. Johnson Space Center is located 20 miles southeast of Houston, Texas. NASA owns 1,581 acres of land at the Houston site and uses another 60,552 at the White Sands Test Facility, Las Cruces, New Mexico. The total capital investment including land, buildings, structures and facilities, equipment, and other fixed assets was \$2,339,529 as of September 30, 1999.

KENNEDY SPACE CENTER - The Kennedy Space Center is located 50 miles east of Orlando, Florida. NASA owns 82,943 acres and uses launch facilities at Cape Canaveral Air Station and Vandenberg Air Force Base. The total capital investment including land, buildings, structures and facilities, equipment, and other fixed assets was \$1,799,479 as of September 30, 1999.

MARSHALL SPACE FLIGHT CENTER - The Marshall Space Flight Center is located within the U.S. Army's Redstone Arsenal at Huntsville, Alabama. MSFC also manages operation at the Michoud Assembly 15 miles east of New Orleans, Louisiana and the Slidell Computer Complex in Slidell, Louisiana. The total capital investment including land, buildings, structures and facilities, equipment, and other fixed assets was \$1,935,733 as of September 30, 1999.

STENNIS SPACE CENTER - The Stennis Space Center is located approximately 50 miles northeast of New Orleans, Louisiana. NASA owns 20,663 acres and has easements covering an additional 118,284 acres. The total capital investment including land, buildings, structures and facilities, equipment, and other fixed assets was \$473,822 as of September 30, 1999.

GODDARD SPACE FLIGHT CENTER - The Goddard Space Flight Center is located 15 miles northeast of Washington, D.C. at Greenbelt, Maryland. NASA owns 1,121 acres at this location and an additional 6,176 acres at the Wallops Flight Facility in Wallops Island, Virginia. The total capital investment including land, buildings, structures and facilities, equipment, and other fixed assets at both locations was \$2,040,240 as of September 30, 1999.

AMES RESEARCH CENTER - The Ames Research Center is located south of San Francisco on Moffett Field, California. NASA owns 447.5 acres at the Moffett Field location. The total capital investment including land, buildings, structures and facilities, equipment, and other fixed assets at both locations was \$885,458 as of September 30, 1999.

DRYDEN FLIGHT RESEARCH CENTER - The Dryden Flight Research Center is 65 air miles northeast of Los Angeles. Dryden is located at the north end of Edwards Air Force Base on 838 acres of land under a permit from the Air Force. The total capital investment at Dryden, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1999 was \$391,893.

LANGLEY RESEARCH CENTER - The Langley Research Center is adjacent to Langley Air Force Base which is located between Williamsburg and Norfolk at Hampton, Virginia. NASA owns 788 acres and has access to 3,276 acres. The total capital investment including land, buildings, structures and facilities, equipment, and other fixed assets was \$1,002,192 as of September 30, 1999.

LEWIS RESEARCH CENTER - The Lewis Research Center occupies two sites; the main site is in Cleveland, Ohio, adjacent to Cleveland-Hopkins Airport; the second site is the Plum Brook Station located south of Sandusky, Ohio, and 50 miles west of Cleveland. NASA owns 6,805 acres and leases an additional 14 acres at the Cleveland location. The total capital investment including land, buildings, structures and facilities, equipment, and other fixed assets at both locations was \$647,237 as September 30, 1999.

NASA HEADQUARTERS - NASA Headquarters is located at Two Independence Square, 300 E St. SW, Washington, D.C. and occupies other buildings in the District of Columbia, Maryland, and Virginia.